

Expedition 13

by Donna Lin

IT HAS BEEN nearly three years since the International Space Station (ISS) has seen a long-duration crew of three. Two-person crews replaced three-person crews in 2003 to conserve supplies normally carried to the space station by shuttles. That may change with Expedition 13.

Expedition 13 is headed by commander Pavel Vinogradov, representing Roscosmos, the Russian Federal Space Agency (RFSa). He and astronaut Jeffrey Williams, flight engineer and NASA science officer, launched on a Soyuz spacecraft in March from the Baikonur Cosmodrome in Kazakhstan, Russia.

Vinogradov and Williams will be joined in July by their third crewmember Thomas Reiter, a European Space Agency (ESA) astronaut who will fly into space on the upcoming STS-121 mission.

Brazilian astronaut Marcos Pontes launched with Vinogradov and Williams, spending eight days on the station under a contract with RFSa. Pontes returned to Earth with the Expedition 12 crew, composed of commander Bill McArthur and flight engineer Valery Tokarev.

The six-month stay of Expedition 13 will focus on station assembly preparations, maintenance and science in microgravity. Having a third member onboard will enable the crew to work with experiments across a wide variety of fields, including human life sciences, physical sciences and Earth observation as well as education and technology demonstrations.

The crew currently has three spacewalks planned, one U.S. and two Russian. The spacewalks will focus on continued outfitting of the station to prepare external hardware for the addition of station elements and tending to external science experiments. One spacewalk, to be performed by Williams and Reiter, will repair existing and install new components on the station. Vinogradov and Williams will execute two spacewalks in August to deploy and retrieve various payloads outside the Russian segment.

Vinogradov, serving as mission commander, will oversee the day-to-day operation of the Russian portion of the station and maintenance, as well as the well-being of his crew. He said that paying close attention to the upkeep of the space station is important not only because of the monetary value of the station, but the investment of knowledge and human labor that has gone into it.

“A small crew of two people creates a situation where even the smallest detail gains significant importance,” he said. “[During] a long spaceflight, you have to make sure that you pace yourself, that you distribute your strength sort of evenly throughout the flight and build the proper relationship with your crewmates.”

Vinogradov graduated from the Moscow Aviation Institute in 1977 and received the qualification of computer systems analyst in 1980. He has logged 11 hours in L-39 training airplane, and has completed 29 parachute jumps.



NASA astronaut Jeffrey N. Williams, Brazilian astronaut Marcos Pontes and cosmonaut Pavel V. Vinogradov, Expedition 13 commander, wave goodbye to the cameras at the launch pad in Baikonur, Kazakhstan as they board the launch vehicle.

He is no stranger to spaceflight, having performed a 198-day spaceflight as the Expedition 24 prime crew flight engineer onboard the Soyuz TM and Mir station from Aug. 5, 1997 to Feb. 19, 1998. Vinogradov also conducted five spacewalks during his mission.

As the flight engineer for Expedition 13, Williams is responsible for the operation and maintenance of the U.S. segment of the station. He will also contribute to the science and research projects planned, and prepare for the arrival of space shuttles and payloads while on the station.

Williams said the tasks he will undertake on the station are challenging because of the wide range of responsibilities he and his crewmembers must face.

“The big challenge comes in integrating all of [our responsibilities], keeping up, and covering a broad spectrum of work and tasks and responsibilities as we go through the six months,” Williams said.

Williams received his bachelor’s degree from the U.S. Military Academy in 1980 and a master’s degree in aeronautical engineering from the U.S. Naval Postgraduate School in 1987. He has logged over 2,500 hours in more than 50 different aircraft. Williams served as the flight engineer and lead spacewalker on STS-101 from May 19 to 29, 2000, completing a spacewalk during the mission.

Reiter, a flight engineer for Expedition 13, is the first non-American and non-Russian long-duration crewmember. Representing ESA, Reiter’s presence on the space station provides the crew with the extra labor necessary to focus more on assembly efforts, rather than maintaining the station alone.

He will assist in maintenance of onboard systems in the Russian side of the station, and will perform repair work as necessary on the U.S. side. Reiter will also perform a spacewalk with Williams, installing two platforms containing materials that will later be examined for effects from exposure.

Reiter said that although his presence on the space station is a major milestone for ESA and the space station partners, it is just the beginning.

“Even though there have been a lot of my colleagues to the station in the last years, only for [a] short time, this is a moment that also signifies the station [may] get a little bit more international,” he said. “In the future there will be more of my colleagues from ESA, from the Japanese space agency, and also from the Canadian Space Agency...and the agencies that are involved in the ISS program.”

Reiter graduated from the Armed Forces University in Neubiberg, Germany, and the Empire Test Pilots School in Boscombe Down, England, in December 1982 and December 1992, respectively. He has a master’s degree in aerospace technology. Reiter’s flight experience includes more than 2,300 hours in more than 15 aircraft. He served as onboard engineer for the Euromir 95 mission, completing two spacewalks from Sept. 3, 1995 to Feb. 29, 1996.

The advantages of having a three-person space station crew are echoed in the words of Williams, who said that a third crewmember would allow the accomplishment of work outside of daily station operations.

“Getting back to a crew of three will help us [to] be able to accomplish more,” he said. “We will be continuing with the assembly of the space station, to get it up to its full capability with the resuming of regular space shuttle flights, which is important to meet the Vision for Space Exploration.”

Upon the shuttle’s arrival, Reiter’s equipment will be transferred to the Soyuz and the shuttle crew will begin to move its payload to the station. The shuttle crew will immediately berth the Multi-Purpose Logistics Module, transferring its supplies, equipment and space parts to the space station. Equipment on the station that is no longer in use will be moved onto the space shuttle to return to Earth. STS-121 crewmembers will also perform three spacewalks while onboard the space station.

In addition to the Expedition 13 crewmembers assisting in these operations and supporting the STS-121 crew in completing the



Astronaut Jeffrey N. Williams, left, flight engineer and space station science officer for Expedition 13, smiles for the camera onboard the space station. At right, Brazilian Space Agency astronaut Marcos Pontes uses a computer in the Destiny laboratory of the space station.



Cosmonaut Pavel V. Vinogradov, Russia's Federal Space Agency Expedition 13 International Space Station commander, completes the traditional signing of a bedroom door at the Cosmonaut Hotel in Baikonur, Kazakhstan.

spacewalks, Vinogradov and Williams must also undertake a special task to photograph the underside of the orbiter as it approaches the station to dock.

“As [the shuttle] approach[es] for docking, [it] will literally do a somersault end over end,” Williams said. “During that time we will take 150 or more photographs, which will then be immediately downlinked to the ground so the engineers can analyze the photography for any potential damage.”

Vinogradov said his crew will help set the tone for future partnerships and collaborations between different countries and teams.

“It’s even hard to believe now, hard to imagine how we worked in different countries, each in our own corner,” he said. “It’s not only Russia and [the] U.S., but it’s Europe, Canada, Japan; we’re so much better integrated. And if we have more areas like that, I think it would benefit the world at large.”

Trekking through the final frontier

by Catherine E. Borsché



Astronaut Michael E. Lopez-Alegria, STS-113 mission specialist, participates in the mission's second scheduled spacewalk to perform work on the International Space Station. The space shuttle Endeavour, docked to the Pressurized Mating Adapter 2, is visible below Lopez-Alegria.

Trekking through low-Earth orbit seems to begin with a single step—or more appropriately, a single bound from the airlock. But for all the ease and floating you see on TV, enormous preparation has taken place to ensure an astronaut's spacewalk appears effortless.

The Extravehicular Activity (EVA) Office works across various programs and organizations to orchestrate a seamless spacewalk. The amount of collaboration that goes into each spacewalk is a testament to the group's dedication and hard work, even years before an actual spacewalk debut.

"Pulling together all the pieces necessary to implement a series of EVAs is a significant effort by a team of very talented individuals from multiple organizations across the center," Stephen Doering, manager of the EVA Office at Johnson Space Center, said. "They each have a vital role to play in ensuring the safety and success of the EVA in support of the International Space Station and Space Shuttle Program requirements."

An EVA plan, in most cases, is hatched far in advance of the actual spacewalk execution.

"Some of the EVAs that we're executing now we've established the requirements for in the late 1980s," said Nancy Patrick, Detailed Test Objectives 849 sponsor and principal investigator. "But I'd say it's more like two years beforehand if it's a brand-new task that we hadn't thought of before and we need to build some new hardware to support it, train crews and figure out how to do it and write the procedures for it."

Once the plan is in motion, crew assignments determine how hardware and training tasks are fleshed out.

The juggling of spacesuit hardware is a delicate give-and-take process in itself.

"We track and plan out the suits and the tools that we're flying for the flight, making sure that we've got the right-sized suits for the increment crews that are going up and [look at] how we can interchange hardware to stay within life," Kenneth Kruse, EVA Logistics manager, said. Though it may come as a surprise, suits have expiration dates just like the food one buys at a grocery store. The EVA Office monitors the condition of all its equipment to ensure it is safe and suitable for the rigors of flight, or "within life."

Kruse indicated that instead of just bringing all new hardware up for a particular flight, the EVA Office looks at what

hardware is already on orbit that could possibly fit the new crew for their spacewalks.

The EVA professionals working under the Mission Operations Directorate are unique because they train the astronauts for their spacewalks and are also responsible for flight control duties during missions.

"Once the crew's assigned, we are involved with them from the very beginning, all the way through the flight and post-flight," Paul Boehm, EVA flight controller and instructor, said.

To prepare for a mission the crew undergoes a wide variety of intensive training.

Boehm's group conducts exercises, such as vacuum chamber runs with the astronauts, which work to familiarize astronauts with their spacesuits. But the vacuum chamber is not the only platform used to prepare an astronaut for a spacewalk.

"We go through all the training aspects; we do training in the Virtual Reality Lab and the Neutral Buoyancy Lab (NBL), a lot of tabletop [sessions] looking at hardware," Tomas Gonzalez-Torres, STS-121 EVA flight lead, said. "We fly down to the Cape [Canaveral] with the crew to see the hardware, and after the training is complete, we sit on console."

The training that the astronauts receive in these state-of-the-art facilities help make the actual spacewalk easier.

"Basically, there's no one facility that gives you full training to get ready for the EVAs, so what we do is kind of piece together different aspects from different facilities," Gonzalez-Torres said. "For example, the NBL gives you the suited aspect, so we can put the crew inside the suits and pressurize the suits to give them that feel. It's also physically demanding, so it's good practice for them. They can also see all the mockups, the worksite and actually perform the tasks as they will perform them on orbit."

Flexibility is the key when it comes to preparing for any mission, especially shuttle. Launches slip—and can slip to the point of major reshuffling efforts.

"One of the big things is working with different groups, saying, 'Okay, we expected to launch here and now we're going to launch a couple months later.' Maybe that puts us in a different increment," Aaron Mears, EVA

flight manager for STS-121, said. "Now not only are we doing our EVAs, but we have to prepare the increment for their EVAs in regards to spacesuit tools and hardware."

"Obviously, training is a big part of it as well, so we work closely with the Mission Operations Directorate with scheduling impacts in regards to training and NBL runs," Mears said. "You get real busy as you get close to a flight, and then if it slips everyone kind of has this 'OK, let's slow down and catch our breath' thing. But you don't want to do that for too long, because you know you're going to get busy again."

With the fluidity of flight plans and training, teamwork ensures the smooth coordination of spacewalks for the EVA Office. Because the shuttle and station programs are so intertwined, each affects the other. As Mike Hembree, Increment 13 EVA manager, explained, not only do you have to negotiate within different organizations, but you also have to negotiate plans and changes with international partners such as Russia. The Russian Federal Space Agency is "currently designing a new version of the Orlan spacesuit, and we're helping to provide some requirements that we'd like to see to help it become integrated more in line with U.S. tools," Hembree said.

When the astronaut finally gets out of the airlock and ventures into space, all the training and coordination is well worth the successful completion of the spacewalk tasks.

"It's interesting, because we've gone through so much training and we've seen these guys do this in the water so many times, a lot of times it feels like we're just back at the NBL. The neat part is you get to see the sunrise, sunset cycle, so you know that it's real, and obviously you're sitting in Mission Control," Gonzalez-Torres said. "And a lot of times we've heard the crew say that basically the only thing missing [is] the divers."

For the professionals working in and with the EVA group, the culmination of a spacewalk is the epitome of their dedicated efforts.

"We know this is what we've all been working toward for many years, and we want to make sure we do the best job possible," Gonzalez-Torres said. "Everybody remains very focused and excited at the same time."



European Space Agency astronaut Thomas Reiter of Germany, attired in a training version of the shuttle launch and entry suit, simulates a parachute drop into water during an emergency bailout training session at the NBL. Specialized training facilities such as the NBL help simulate the spacewalking environment for astronauts prior to the mission.

It ‘makes’ a village

by Kendra Phipps

Johnson Space Center has often been likened to a college campus, or to a small city. The comparison is not far off: Among its tree-lined walkways, JSC employees can find office buildings, shops, a medical clinic and a gym, not to mention utility systems and emergency services.

Like any community, JSC needs a talented behind-the-scenes team—in this case, the Center Operations Directorate (COD)—to keep things running smoothly.

“I enjoy keeping the center looking nice, building new stuff and keeping the old stuff working,” said COD Director Joel Walker. “It’s a challenge, but it’s a fun challenge.”

COD is responsible for the center’s facilities, security, utilities and environmental efforts. Its employees keep the power running, prepare for emergencies, upgrade equipment, negotiate export agreements and check up on the center’s wildlife. In many ways, their work frees up the rest of the JSC team to focus on human spaceflight.

The group’s work is important every day of the year, but like many organizations on site, things start to shift when a space shuttle mission draws near. Extra effort goes into certain areas—for example, JSC security.

“We increase our security posture; we turn things up,” said Alan Mather, chief of COD’s Protective Services Division. Protective Services encompasses JSC’s Security Branch, as well as Emergency Management and International Services.

The mission-related security enhancements come in the form of heightened awareness at the center gates, as well as additional guards stationed in key areas like the Mission Control Center and the Astronaut Quarantine Facility. Mather said that some administrative work increases in the weeks before a mission, as more visiting media and guests arrive.

“We also prepare (security information) packets for astronauts’ families,” said Mather. Closely tied with the Security Branch is the

Emergency Operations Center (EOC), which works to prepare JSC for potential crises. The EOC coordinates contingency plans and acts as a central information source in case of an emergency.

The International Services Office also has plenty to do in preparation for a mission. Employees who are traveling to the shuttle’s international abort-landing zones need security briefings, which the office provides, and shuttle payloads need all the proper export certifications and documentation. The office’s counterintelligence group also maintains a diligent search for potential safety threats.

“We’re always evaluating the overzealous fans that send letters or try to contact astronauts,” said Mather. “We look at all those types of communications and e-mails, especially the ones that are a little over-the-top. That’s an ongoing effort.”

Also ongoing are the efforts by COD’s Environmental Office to keep JSC in line with all environmental regulations. The group monitors JSC’s air pollution, waste emissions and spills, and also seeks out and implements new conservation solutions.

When shuttle missions approach, the Environmental Office maintains its usual duties and also keeps an eye on mission-related waste materials—a job that recently became a little simpler.

“Since all flight film comes back to JSC, our biggest mission-related issue used to be the photo lab,” said Environmental Project Specialist Sandy Parker, referring to the chemical processes needed to develop thousands of mission photos. “We worked with them to produce the new zero-discharge system, and that has eliminated a lot of environmental impact. With the new system, everything is recycled.”

Parker said that effort speaks to NASA’s overall commitment to conservation. “I feel that NASA tries to do the right thing as far as protecting the environment, and that’s really important to me,” she said.

In the middle of complex mission preparations, it might be easy to overlook a common-sense item on the checklist: making sure the electricity stays on. Fortunately, COD is on top of that, too. The directorate’s Facilities Management and Operations Branch handles the backup power plant, housed in Building 48, as well as the central heating and cooling systems in Building 24.

Sheila Powell, the deputy chief for Facilities, said that the



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Top photo: Joe Ochoa, Training Chief Operator for Computer Science Corporation, operates the diesel generator in Building 48.
Above: Willie Dean, Building 48 Operator for Computer Science Corporation, and Ochoa work on the diesel generator.

group goes into “mission mode” 37 days before launch, following checklists and conducting mission readiness reviews. Then, two weeks out, some of the group’s normal work functions are shut down in favor of mission support.

But what if something breaks in the emergency power plant? COD’s Logistics Branch covers that contingency, making sure that mission-critical spare parts are stocked before the shuttle ever leaves the ground.

“We have backups to make sure that they can do any repairs that they need,” said Logistics Chief Linda Massey.

While some of COD’s everyday work gets postponed during a shuttle mission, the goal is to keep things as seamless as possible for the JSC workforce.

“We just try to keep things predictable and stable,” said Walker.

By letting the JSC team focus on spaceflight instead of spare parts, COD plays a crucial role in moving towards the Vision for Space Exploration. Each flight is a step closer, and Mather said his team is proud to be a part of it.

“Everybody enjoys doing it—this is what we live for, what we work for,” said Mather. “Everybody likes to be flying.”



NASA/DeHoyos JSC2006E13548

Team members work on the Building 48 Cooling Tower.